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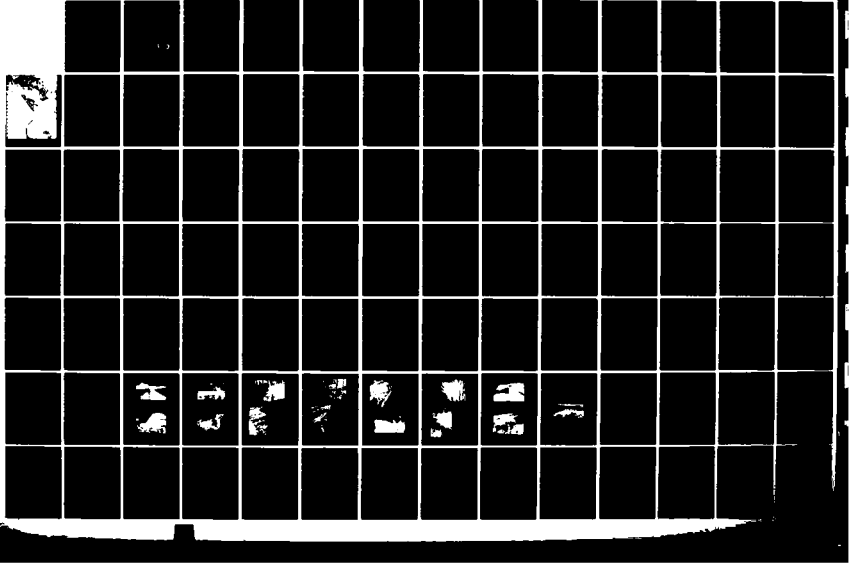

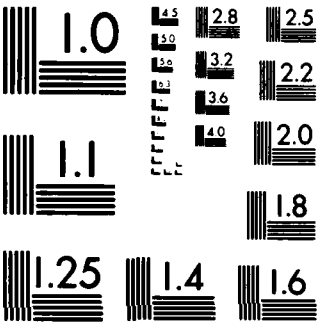

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CONNECTICUT RIVER BASIN

HOLYOKE, MASSACHUSETTS

McLEAN RESERVOIR

MA 00539

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

MARCH 1979

UNCLASSIFIED
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Connecticut River Basin
Holyoke, Massachusetts
McLean Reservoir

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

THe dam is comprised of a 700 ft. long, 35 ft. high earthfill embankment and a 920 ft. long, 15 ft. high earthfill dike. The dam is generally in fain condition It has a size classification of intermediate and a hazard classification of low. Remedial measures consist of removal of all brush and trees from the downstream slopw of the main dam and spillway channel and repair of spalled and deteriorated concrete on the emergency spillway.

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REPLY TO
ATTENTION OF
NEDED

MAY 2 1979

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

I am forwarding to you a copy of the McLean Reservoir Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, City of Holyoke, Board of Water Commissioners, Holyoke, Massachusetts 01040.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

NATIONAL DAM INSPECTION PROGRAM
PHASE I INVESTIGATION REPORT

Identification No: MA 00539

Name of Dam: McLean Reservoir

City: Holyoke

County and State: Hampden County, Massachusetts

Stream: McLean Reservoir

Date of Inspection: December 6, 1978

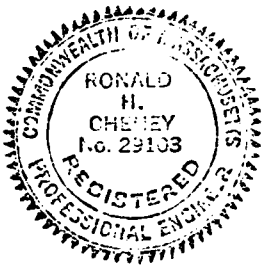
The dam is comprised of a 700± foot, 35 foot high earthfill embankment dam and a 920± foot long, 15± foot high earthfill dike, a gatehouse with outlet controls and a 10 foot wide concrete arch emergency spillway. The reservoir is fed by a 20 inch line from the Tighe Carmody Reservoir and the drainage area. Discharge through the gatehouse enters the Holyoke Water Department Supply System. Construction of the dam was completed in 1903. The dam's purpose has always been water supply. The facility has always been owned, operated and maintained by the Holyoke Water Department.

Visual inspection indicated that the dam is in generally fair condition.

The dam has a size classification of intermediate and a hazard classification of low. According to Corps guidelines, the test flood would be the 100 year storm. The inflow would be 375 cfs. With the water level assumed to spillway crest at time of test flood, spillway discharge of about 30 cfs would occur. The reservoir would be surcharged to elevation 433, four feet above the spillway crest and two feet below the dam crest. The dam will not be

overtopped. There were no indepth engineering data available and therefore, the adequacy of the dam was evaluated based primarily on visual inspection, past performance history, and engineering judgement.

The dam is generally in fair condition. Remedial measures consist of removal of all brush and trees from the downstream slope of the main dam and spillway channel and repair of spalled and deteriorated concrete on the emergency spillway. It is further recommended that the owner engage a qualified engineer to investigate the seepage conditions at the downstream toe. These recommendations and remedial measures should be implemented by the owner within one year after receipt of this Phase I Inspection Report.



Ronald H. Cheney

Ronald H. Cheney, P.E.
Associate

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

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This Phase I Inspection Report on McLean Reservoir has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joseph W. Finegan, Jr.

JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Inspections. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends or numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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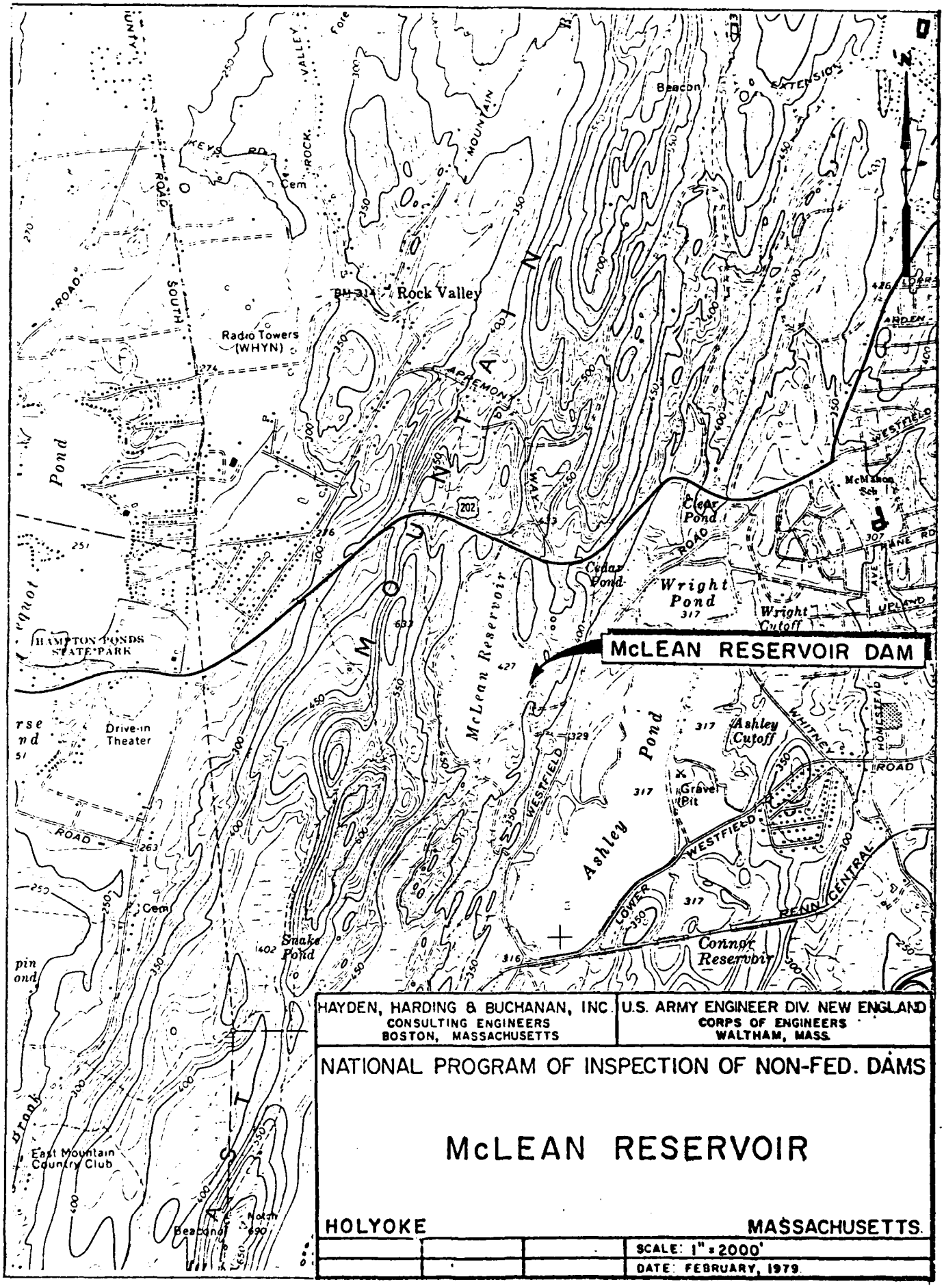


HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

McLEAN RESERVOIR

HOLYOKE MASSACHUSETTS.

SCALE: 1" = 2000'	
DATE: FEBRUARY, 1979	

PHASE I
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: McLEAN RESERVOIR

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Hayden, Harding & Buchanan, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued Hayden, Harding & Buchanan, Inc. under a letter of 28 November 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW 33-79-C-0012 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

The dam, McLean Reservoir is located in the City of Holyoke, in Hampden County, Massachusetts. The reservoir is formed by the drainage from the north central portion of East Mountain. The dam is located along the southeastern shore of the reservoir. McLean Reservoir is shown on the Mount Tom Quadrangle, Massachusetts and has the approximate coordinates of North 42° 10' 30" West 72° 40' 12"

b. Description of Dam and Appurtenances

The dam is comprised of an earthfill embankment, a gatehouse with outlet controls, an earthfill dike, and an emergency spillway. The embankment has a maximum fill height of 35 feet, a plan length of 700 feet and an average crest width of about 24 feet. The central portion of the embankment contains a mortared masonry core wall founded on ledge. The upstream embankment face is partially

ripraped and sloped at 2½ horizontal to 1 vertical. The downstream face has a 3:1 slope and is lined with turf, rockfill, brush and trees. The dike has a plan length of about 920 feet, a maximum fill height of about 15 feet and also contains a mortared masorny core wall founded on ledge. The typical crest width is 12 feet. A gravel access road traverses both the dam and dike. The dikes upstream face is stone paved and sloped at 2 horizontal to 1 vertical. The downstream area in front of the dike is filled in with spoil material removed from the basin of the reservoir. The emergency spil way is located near the dam and dike interface and is a 3.75 foot high by 10 foot wide concrete arch culvert. The base of the spillway is founded 6 feet below the crest of the dam and is lined with unmortared stone. The fieldstone masonry gatehouse is located at the center of the earth embankment. It contains the manual controls for a 30 inch diameter outlet pipe and a 20 inch diameter inlet pipe. The intake structure for the 30 inch outlet pipe is located about 100 feet upstream of the gatehouse and the outlet pipe feeds to a chlorinating station at Ashley and eventually into the Holyoke Water Stystem. The 20 inch inlet pipe feeds water to the reservoir from the upstream Tighe Carmody Dam. This line is controlled at the gatehouse and has its outlet located at the toe of the embankment approximately 50 feet upstream and about 50 feet to the east of the gatehouse. Prior to 1963 these 2 lines were both used as outlets for the McLean Reservoir.

However, due to the reservoir's low recharge capability, this original system could easily drain the pond.

The present system of operation is with the inlet pipe normally open and the outlet pipe feeding between 3 and 5 million gallons a day into the Holyoke Water System.

c. Size Classification

The dam is classified as intermediate according to its impoundment capacity of 1240 acre feet and height of 35 feet.

d. Hazard Classification

McLean Reservoir is classified as low hazard. Land below the dam is owned by the Ciy of Holyoke for use by the Water Department. The land is wooded and undeveloped and it is unlikely to be developed. Ashley Pond (part of the water supply system) is about 2000 feet downstream.

e. Ownership

The dam is owned by the City of Holyoke Board of Water Commissioners and has always been part of their water system.

f. Operator

The designated caretaker of the dam is Mr. Edward Welsh, Superintendant of the Holyoke Water Department, 20 Commercial Street, Holyoke, Massachusetts 01040. Telephone (413) 536-0442

g. Purpose of Dam

The purpose of the dam has always been water supply.

h. Design and Construction History

The original design plans were prepared by J.L. Tighe and dated 1899 through 1903. The dam was constructed in 1903. Subsequent repairs were performed on the corewall of the dike in 1939, when seepage through several corewall cracks were sealed. The original outlet pipes system consisting of two 20-inch lines was modified to one 30-inch line in 1963.

i. Normal Operational Procedures

There is nominal operational procedure for this dam. The level of the reservoir and quantity of outlet water is dependant on the demand of the system. The reservoir has additional water feed to it via a 20-inch inlet from the Tighe Carmody Reservoir. This 20-inch line is controlled at the gatehouse and is normally left open. There is a 30-inch outlet line which is controlled at the gatehouse and normally drains 3 to 5 million gallons of water per day into the Holyoke Water System.

1.3 Pertinent Data

a. Drainage Area

The drainage area (301 acres - 0.47 s.m.) is comprised of wooded hills sloping towards the reservoir, and flat to hilly land immediately around and to the north of the impoundment. Runoff drains directly into the reservoir or from a swampy area to the north.

Development within the drainage area is limited to the U.S. Route 202 crossing, and several improved and unimproved roads throughout the area.

No residential buildings are located between the outlet for the emergency spillway and Ashley Pond, which would receive its discharge. A culvert under Westfield Road and utility lines are the only structures located below the dam.

The dam has always been used for water supply. The water level is typically well below the spillway level. The small drainage area does not provide adequate runoff into the dam to be useful for water supply. As such, a 20-inch pipe brings water from the Tighe Carmody Reservoir to maintain the reservoir's water level. Daily flows normally vary between 3 to 5 million gallons.

b. Discharge at Dam Site

This dam has a 30-inch CI pipe located near the central portion of the earth embankment, which is used as a water supply intake. Flow through the pipe is controlled manually at a fieldstone masonry gatehouse with the intake structure located about 100 feet upstream of the house. The intake pipe invert is at elevation 411.0±.

The spillway is comprised of a 3.75' x 10' arched culvert. A 3' high overflow weir was installed in the outlet channel approximately 15 feet downstream of the arch. This weir reduces any flow through the culvert. With water at the top of dam, flow through the culvert would be about 36 cfs.

Specific information pertaining to maximum flood discharges at this site is not available. According to personnel

of the Holyoke Water Department, the dam was not overtopped by the 1955 flood and the emergency spillway has only been used once in the last 10 years. The crest elevation of the emergency spillway is 429.

For the 100 year flood the emergency spillway outflow is 30 cfs at elevation 433.0, with the water level at elevation 429 just prior to the storm.

c. Elevation (ft. above MSL)

(1) Streambed at centerline of dam----------400±

(2) Maximum tailwater---------spillway discharges to steep channel D.S.; backwater minimal

(3) Upstream portal invert diversion tunnel----------none

(4) Recreation pool----------(Water Supply Reservoir)--N/A

(5) Full flood control pool--(Water Supply Reservoir)--N/A

(6) Spillway crest-(weir elevation432.)-----(ungated) 429

(7) Design surcharge (Original Design)----------unknown

(8) Top Dam ----------435

(9) Test flood design surcharge---------- 433.0 (100 yr.) (assuming 429 for a base elevation)

d. Reservoir

(1) Length of maximum pool---------- 2000'(100 yr.)

(2) Length of recreation pool----------none (water supply) normal pool:2000'

(3) Length of flood control pool--------- N/A (water supply)

e. Storage (acre feet)

(1) Recreation pool----------(water supply) N/A

(2) Flood control pool----------(water supply) N/A

(3) Spillway crest pool-----(elevation 429)----------960±

(4) Test flood pool----------1200

(5) Top of dam----------1240

f. Reservoir Surface (acres)

(1) Flood control pool----------N/A

(2) Recreation pool---none (water supply) normal pool 43±

(3) Spillway crest----------46±

(4) Test flood pool----------59±

(5) Top Dam----------72±

g. Dam

(1) Type----------Gravity, earth embankment and dike

(2) Length------- 700'±(dam section) 920'± (dike section)

(3) Height---------- 35'(dam) 15' (dike)

(4) Top Width--------24' (dam section) 12' (dike section)

(5) Side Slopes----------2½:1 riprap U.S. 3:1 turf D.S.

(6) Zoning----------none

(7) Impervious Core-mortared masonry wall founded on ledge

(8) Cutoff---------- core wall 3' into ledge

(9) Grout curtain----------none

h. Diversion and Regulating Tunnel----------none

i. Spillway

(1) Type---- concrete arch culvert with overflow weir (see photos 2,3 and Appendix B plans)

(2) Length of weir----------10'

(3) Crest elevation----------culvert 429, weir 432

(4) Gates ---------- none

(5) U/S Channel-----10' wide rock lined with concrete side walls

(6) D/S Channel-----10' wide rock lined with concrete side walls, weir

(7) General-------weir and arch restrict flow through outlet channel

j. Regulating Outlets

The regulating outlets for this dam consist of a 30" C.I. outlet pipe for water supply (City of Holyoke Water Department) and the 10' wide concrete arch culvert emergency spillway. The outlet pipe is operated manually from controls located within a fieldstone-masonry gatehouse at the center of the earth embankment. Its intake structure is located approximately 100' upstream of the gatehouse and has an invert elevation of 411±. The 30" pipe feeds to a chlorination facility and eventually to the Holyoke Water Supply system.

As previously described, the emergency spillway (shown by photos 2,3 & 4) is lined with unmortared stone and has concrete sidewalls. The crest invert of the culvert is at elevation 429. The arched culvert is 3 to 3.75 feet high. The crest of the overflow weir is at elevation 432. The effective outlet is very small, having a low discharge rate.

SECTION 2
ENGINEERING DATA

2.1 Design

The dam was designed by J.L. Tighe in 1899 to 1903. Design plans dated 1899 through 1903 were located at the Holyoke Water Department. Design plans outlining corewall leakage in 1939 were also located . No indepth engineering design calculations were located.

2.2 Construction

The dam was built in 1903. Plans were found at Holyoke Water Department dated 1903, outlining cross sections used for construction estimates and cement tests. No other construction data was located.

2.3 Operation

No engineering operational data was located.

2.4 Evaluation

a. Availability

The original plans and 1939 plans were made available at the Holyoke Water Department, Holyoke, Massachusetts. State Inspection Reports from 1974 and 1977 along with some correspondence were made available at the Department of Environmental Quality Engineering, Division of Waterways, Boston office.

b. Adequacy

The lack of indepth engineering data does not allow for a definitive review. Therefore the adequacy of this dam structurally and hydraulically, can not be assessed from the standpoint of review of design calculation, but must be based primarily on the visual inspection, past performance history, and sound engineering judgement.

c. Validity

The visual inspection of this facility showed no reason to question the validity of the information supplied.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General

McLean Reservoir Dam was inspected on December 6, 1978. At that time there was no water flowing over the spillway and the reservoir was frozen just upstream of the embankment. The outlet gate was open during the inspection.

b. Dam

The dam consists of a main embankment section with a maximum height of about 35 feet. The main embankment is about 700 feet long. An embankment dike extends beyond the right abutment of the main dam. This dike is approximately 920 feet long and has a maximum height of about 15 feet. Photo 1 shows the crest and upstream slope of the main dam in the foreground and the dike in the background.

A spillway structure is on the right abutment passing through the embankment and forms the boundry between the main embankment section and the dike.

Upstream Slope

The upstream face of the dam is on a slope of 2.5:1. The upper 10± feet of the upstream slope was above the reservoir and available for inspection. The riprap slope protection extended from the water surface to within about 4 feet of the dam crest, photo 1. Above the riprap the upstream surface is covered with grass.

The riprap is in good condition and no slumping or slides were observed above the reservoir level.

Crest

The crest of the dam is about 24 feet wide and grass covered. No evidence of cracking or misalignment of the crest was observed.

Downstream Slope

The downstream face of the dam is on a slope of 3:1. The downstream slope is overgrown with grass, bushes brambles, and small trees. The overgrown condition of the slope is shown in photos 4 and 12. This dense growth makes inspection of the downstream face very difficult.

There are numerous bedrock outcrops at the toe of the downstream slope as shown in photos 7 and 9. The observation is consistent with early drawings of the dam which indicate it is founded on bedrock.

Photo 7 shows the numerous small trees which have grown along the downstream toe of the dam

Standing water was observed at the toe of the slope between the spillway on the right abutment and a point opposite the gatehouse. At the time of inspection the water surface was covered with leaves, but in some places the water was 4 inches deep. Photo 8 shows a wet area about 30 feet from the spillway. At this point the ground is so soft and wet that a stick could be inserted easily below the water surface a distance of about 18 inches.

Seepage at the downstream toe has been noted during previous inspections, and during an inspection performed on January 24, 1974, it was noted that visible seepage was exiting from a rock fill at the toe of the dam. This previously noted seepage was not observed during this inspection but water was exiting along rock joints above the toe of the dam near the right abutment, as shown in photo 9. A rock fill has been placed at the downstream toe in about the central one third of the dam. The slope of this fill is shown in photo 11. Previous inspection reports indicate that this rock fill was placed because of excessive seepage in this area. Details of when the rock fill was placed and the type of materials used in the fill were not available.

c. Appurtenant Structures

The spillway, which is located in the right abutment area, is 10 feet wide. The approach channel to the control weir passes through the embankment. This approach section is shown in photo 2. The floor of the channel is paved with boulders. The left training wall of the spillway, which retains the embankment, is in poor condition. Photo 3 shows the control weir and the concrete lined discharge channel immediately downstream. The concrete is placed on bedrock, and

there are numerous bedrock outcrops along the discharge channel, as indicated by photo 6. The fieldstone masonry gatehouse is in good condition with no signs of needed repairs. The gate feeding the water system was open during the inspection. The outlet from the gatehouse feeds water into the Holyoke Water System through a 30-inch pipe. A 20-inch diameter pipe feeds water to this reservoir from the Tighe Carmody reservoir. The gate for this pipe was also open during the inspection. Both pipes are located beneath the surface and could not be observed during the inspection. The emergency spillway according the City personnel has only received water once in the last 10 years.

d. Reservoir Area

The reservoir area slopes are relatively steep and contain no houses. A more detailed description of the drainage area is included in Section 1.3.a of this report. The amount of siltation within the reservoir is unknown.

e. Downstream Channel

The spillway discharges into a poorly defined channel at the base of the right abutment. Bedrock outcrops immediately opposite the discharge channel form a wall about 6 feet high. There are numerous trees growing in and adjacent to the channel.

3.2 Evaluation

Visual inspection indicates that the dam is in fair condition. Seepage was observed over a large portion of the downstream toe. A rock fill berm has been placed after

initial construction presumably to arrest damage to the embankment due to excessive seepage. The details of the construction of this berm were not available.

Excessive growth of grass, bushes, and trees on the downstream slope prevent a thorough examination of this slope.

The spillway was observed to be in poor condition with excessive spalling and deterioration.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

The major purpose of the McLean Reservoir Dam is for water supply for the City of Holyoke. The normal operating procedure is for the 30-inch outlet line to be left open to feed water to the Ashley Chlorinating Station and then into the City water system. The controls for the outlet line are located in the gatehouse and are regulated according to demand by the Holyoke Water Department. The 20-inch inlet line normally feeds water to the reservoir from the Tighe Carmody Reservoir. A further description of these lines is given in Section 1.2.b.

4.2 Maintenance of Dam

The dam is maintained by the Holyoke Water Department. They are responsible for reviewing the State Inspection Reports and instituting the necessary repairs. Heavy brush was found on the downstream face during this inspection.

4.3 Maintenance of Operating Facilities

The gate valves which operate the intake and supply pipes are operated regularly by the City.

4.4 Description of Warning Systems

There are no warning systems in effect at this facility.

4.5 Evaluation

Since the gates are operated on a regular basis no formal operating procedure appears to be necessary. With the exception of the poor condition of the emergency spillway,

the heavy growth on the downstream face and the possible toe seepage discussed in Section 3.1, the dam appears to be in good condition. However, due to the aforementioned conditions the overall condition of the dam is considered to be fair. This dam should be inspected yearly by qualified personnel who can identify any areas of concern which could in time lead to serious deficiencies.

SECTION 5
Hydraulic/Hydrologic

5.1 Evaluation of Features

a. General

The dam was designed and is used as a water supply reservoir. It is a 35 foot high earth fill structure with a storage capacity of 1240 a-f. The surrounding drainage area (300 acres) is undeveloped wooded land. Below the dam there is no developement except for Westfield Road. East of Westfield Road are Ashley Pond, Wright Pond and Connor Reservoir. All are part of the Holyoke Water Supply System.

b. Design Data

The dam was designed from 1899 to 1903. Construction was completed in 1903. No design calculations were located. The dam has always been used for water supply and is maintained by the City of Holyoke.

c. Experience Data

Discussions with Water Works employees indicated that the dam has never been overtopped. During the August 19, 1955 hurricane, the Holyoke area received about 18 to 19 inches of rainfall. The water level is usually several feet below the spillway elevation.

d. Visual Observations

The dam shows no evidence of having been overtopped. There is no defined outlet channel below the spillway. Visual observations of the drainage area and general vicinity

show it to be generally as indicated on the U.S.G.S. map. This is described in Section 1.3 of this report.

e. Overtopping Potential

Due to the dam's size and hazard potential, the test flood chosen was the 100 year storm. The peak inflow is 375 cfs from the 300 acre drainage area. The water level is normally well below the spillway elevation of 429. The storage capacity is large enough to retain the runoff without water reaching elevation 429, spillway crest, except after periods of very prolonged rainfall conditions.

The outlet culvert has an arched top and an overflow weir (see photos 2 and 3 and Appendix B plans). The top of the weir is 0.7± feet below the arch. The actual flow channel is very small and restricted.

If the water level were assumed at elevation 429, the pond could retain the 100 year inflow of 375 cfs and be surcharged to elevation 433. The outflow through the small arch opening would be about 30 cfs. With the water level below elevation 429 there will be no outflow as the storage capacity exceeds the volume of runoff.

f. Dam Failure Analysis

Assuming the dam failed, about 60,000 cfs of water would be released. There are no homes or developed areas below the dam. Sections of Westfield Road, a gravel

road serving only the reservoir, could be washed out or blocked by floodwater. The released waters would flow overland into the lower ponds. At Westfield Road, the flood stage at elevation 327± would cover the road with about 7 feet of water.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observation

The visual observation did not disclose any immediate stability problems. However, the left training wall of the spillway approach channel which also acts as a retaining wall for the embankment is badly deteriorated. Failure of this wall would expose the embankment to spillway flows.

Significant seepage was found at the downstream toe of the main dam, and the exit points of this seepage could not be delineated at the time of the inspection.

b. Design and Construction Data

According to drawings dated 1903, the main dam and the dike have a mortared masonry core wall. The drawings indicate that the main dam was built on bedrock. The most impervious fill available during construction was placed upstream of the core wall and "rolled in 4 inch layers." Debris taken from the reservoir cleaning operation was placed on the gravel downstream slope.

The dike was constructed with gravel upstream and downstream of its central core wall. The downstream surface of the dike was used as a disposal area for waste material removed from clearing of the reservoir.

A 24 inch diameter intake pipe leading to a 30 inch diameter feed pipe downstream of the gatehouse passes through the main dam above the bedrock foundation. A 20 inch diameter pipe now used as a feed to this reservoir from the Tighe Carmody

reservoir is located in a trench excavated in the bedrock. Details of the construction of these pipes were not available. Since they are located beneath the surface, they could not be observed during this inspection.

c. Operating Records

No operating manual was available for this dam.

d. Post-Construction Changes

At an undetermined time after initial construction, a rock fill berm was placed over a portion of the downstream toe. The available information did not indicate why the rock fill had been placed, but it is located in the area of seepage along the toe and may have been placed because of excess seepage in the area. In 1939, repairs were made to the core wall of the dike to correct observed seepage.

In 1963, the inlet-outlet system was modified so that a 20 inch inlet line from the upstream Tighe Carmody reservoir feeds this reservoir. The gate on this line is normally left open. The 30 inch outlet line drains 3 to 5 million gallons per day into the City water system. Prior to 1963, both lines were used as outlets.

e. Seismic Stability

The dam is located in Seismic Zone 2, and according to the USCE guidelines, it is assumed that there is no hazard from earthquake loading.

SECTION 7
ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

The visual examination indicates the dam is in generally fair condition. There were observed indications of seepage on the downstream face of the dam embankment and the spillway was observed to be in poor condition with excessive spalling and deterioration.

b. Adequacy of Information

The information made available, along with the visual inspection, are adequate for a Phase I investigation.

c. Urgency

The recommendations made in Section 7.2 and the remedial measures suggested in Section 7.3 should be implemented within one year after receipt of this Phase I Inspection Report by the owner.

d. Need for Additional Investigation

No additional investigation is needed to complete the Phase I inspection.

7.2 Recommendations

1. It is recommended that the owner engage a qualified engineer to investigate the seepage conditions at the downstream toe and design a seepage collection and monitoring system.

2. Analysis of the test flood (100 year) under normal conditions, indicated the reservoir to have sufficient storage so that no discharge would occur at the spillway. However, the spillway has an extremely low discharge capacity and its wier configuration results in an unusually high potential for blockage. Under periods of extreme prolonged rainfall, or if the reservoir had to be operated at an unusually high storage level, the spillway would be incapable of passing more than minimal additional outflow and the dam would be vulnerable to overtopping. Considering the aforementioned poor condition of the spillway and its low flow capacity, it is recommended that the owner engage a qualified engineer to further investigate this structure in order to design a new structure or repair and/or modify the existing structure.

7.3 Remedial Measures

a. Operating and Maintenance Procedures

1. The owner should remove all brush debris and trees from the downstream slope of the main dam and spillway discharge channel.
2. If in accordance with recommendation 7.2.2 of this report, the existing spillway is to remain in place, the owner should repair all spalled and deteriorated concrete and masonry in the spillway walls and arch culvert.
3. The dam should be inspected yearly by qualified personnel who can identify any areas of concern which could in time lead to serious deficinecies.

7.4 Alternatives

Not applicable to this dam.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT McLean Reservoir

DATE Dec. 6, 1978

TIME 10:30 a.m.

WEATHER Clear 45

W.S. ELEV. 420+ U.S. ____ DN.S.

PARTY:

1. Ronald H. Cheney - HH&B
2. David B. Vine. - HH&B
3. Daniel P. LaGatta - GEI
4. Henry Seidel - Holyoke Water Dept. (Part Time)
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Embankment Dam & Dike	Daniel L. LaGatta	
2.	Gatehouse	Ronald H. Cheney	
3.	Spillway	Ronald H. Cheney	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT McLean Reservoir DATE Dec. 6, 1978

PROJECT FEATURE Embankment Dam NAME D. P. LaGatta

DISCIPLINE Geotechnical engineers NAME R. H. Cheney

Structural Engineer

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	435±
Current Pool Elevation	420 ±
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed.
Pavement Condition	No pavement.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	No misalignment observed.
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	Conditions at abutment good. Spillway training wall badly deteriorated.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	None observed.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	Riprap in good condition.
Unusual Movement or Cracking at or Near Toe	No movement observed.
Unusual Embankment or Downstream Seepage	Area at toe of dam between spillway on right abutment and gatehouse very wet and swampy.
Piping or Boils	No piping or boils observed.
Foundation Drainage Features	None.
Toe Drains	None.
Instrumentation System	None.
Vegetation	Downstream face and toe overgrown.

PERIODIC INSPECTION CHECKLIST

PROJECT McLean Reservoir DATE Dec. 6, 1978

PROJECT FEATURE Embankment Dam NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer NAME Ron H. Cheney

Structural Engineer

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	
Crest Elevation	Dike is extention of main dam along right abutment shoreline beyond spillway.
Current Pool Elevation	
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed.
Pavement Condition	None.
Movement or Settlement of Crest	None observed.
Lateral Movement	No misalignment observed.
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	Good.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	None observed.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	None.
Unusual Movement or Cracking at or Near Toes	None.
Unusual Embankment or Downstream Seepage	None observed.
Piping or Boils	None observed.
Foundation Drainage Features	None.
Toe Drains	None.
Instrumentation System	None.
Vegetation	Area downstream of dike is heavily wooded.

PERIODIC INSPECTION CHECK LIST

PROJECT McLean Reservoir DATE Dec. 6, 1978

PROJECT FEATURE Intake Structure NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	There is no Approach Channel for this facility.
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	The Intake Structure is located approximately 100 feet upstream of the Gatehouse. It is a 24 inch diameter supply pipe with manual controls located in the Gatehouse. The structure could not be visually inspected as it was under water.
Condition of Concrete	
Stop Logs and Slots	

PERIODIC INSPECTION CHECK LIST

PROJECT McLean Reservoir

DATE December 6, 1978

PROJECT FEATURE Gatehouse & Controls

NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer

NAME R. H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	There is no control tower for this facility, however, there is a gatehouse located at the center of the embankment. The Gatehouse is of fieldstone masonry, having a wood roof and concrete floor. The structure is in good condition with no apparent defects.
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	The control for the intake-outlet works is located in the Gatehouse. The control is operated manually. According to City personnel the controls are operated regularly and are in working condition.
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System in Gate Chamber	

PERIODIC INSPECTION CHECK LIST

PROJECT McLean Reservoir

DATE Dec. 6. 1978

PROJECT FEATURE Transition and Conduit

NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer

NAME R. H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	There is a 30 inch outlet pipe which runs from the Gatehouse to the Ashley Chlorinating Station to the water system. This line is underground and could not be visually inspected.
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST

PROJECT McLean Reservoir DATE Dec. 6. 1978

PROJECT FEATURE Embankment Dam NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	None.
Floor of Approach Channel	Paved with boulders - good condition.
b. Weir and Training Walls	The spillway is a concrete arch culvert. The spillway & training walls are highly weathered & in extremely poor condition. The floor is of unmortared scattered stone
General Condition of Concrete	Poor - excessive deterioration.
Rust or Staining	Some stains.
Spalling	Considerable
Any Visible Reinforcing	None observed.
Any seepage or Efflorescence	None observed.
Drain Holes	None.
c. Discharge Channel	
General Condition	The concrete is in poor condition with some spalling & deterioration.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	6-8 trees 6-in. diameter
Floor of Channel	Numerous rock outcrops.
Other Obstructions	Very narrow channel with some vegetation.

PERIODIC INSPECTION CHECK LIST

PROJECT McLean Reservoir DATE Dec. 6. 1978

PROJECT FEATURE Outlet Structure NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	The inlet-outlet structure is the 24 inch supply line running through the embankment under the gatehouse. This line is eventually converted to a 30 inch line feeding the water system.
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain Holes	
Channel	There is no definitive outlet channel for this facility.
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

PERIODIC INSPECTION CHECK LIST

PROJECT McLean Reservoir DATE December 6, 1978

PROJECT FEATURE Service Bridge NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R. H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	There is no service bridge for this facility.
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment and Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat and Backwall	

APPENDIX B

ENGINEERING DATA

LIST OF ENGINEERING DATA

1. Plans dated 1899 to 1903 outlining original construction
2. Plans dated 1939 outlining corewall repairs to the dike

Location: Holyoke Water Department
20 Commercial Street
Holyoke, Massachusetts 01040

No design calculations were located

The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

100 Nashua Street, Boston 02114

City of Holyoke
Board of Water Commisioners
20 Commerical Street
Holyoke, Ma.
ATN; Charles Moran

February 15, 1977
Re: Inspection Dam #2-7-137-7
McLean Reservoir Dam
Holyoke, Ma.

Dear Sir:

On April 23, 1976, an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be Board of Water Commissioners - City of Holyoke If this information is incorrect, will you please notify this office.

The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams Safety Act). Chapter 706 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is ~~conditionally~~ L&R safe. The following conditions were noted that require attention:

The spillway structure has deteroirated slightly more, with cracks in side walls more pronounced - this should be corrected.

Brush growth on downstream slope should be removed.

Dam appears safe, rountine maintenance necessary.

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the dam as indicated above.

Very truly yours,

John V. Hannon, P.E.
Chief Engineer

cc: Mailed 2-16-77
ARE Distr
DOE "

INSPECTION REPORT - DAMS AND RESERVOIRS

1. LOCATION:

City/Town Holyoke. County Hampden. Dam No. 2-7-137-7

Name of Dam McLean Reservoir Dam.

Topo Sheet No. 12A. Coordinates: N 430,200 (Mass. Rect.), E 282,300.

Inspected by: Harold T. Shumway, On April 23,1976. Date Last Inspection 1-24-74

2. OWNER/S: As of April 23, 1976

per: Assessors ____, Reg. of Deeds ____, Prev. Insp. X, Per. Contact X

City of Holyoke

1. Board of Water Commissioners, 20 Commercial Street, Holyoke, Mass.

Name	St. & No.	City/Town	State	Tel. No.

2. _____

Name	St. & No.	City/Town	State	Tel. No.

3. _____

Name	St. & No.	City/Town	State	Tel. No.

3. CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Mr. Charles Moran
Supt. Holyoke Water Dept., 20 Commercial Street, Holyoke, Mass.

Name	St. & No.	City/Town	State	Tel. No.

4. DATA:

No. of Pictures Taken None. Sketches See description of Dam.
Plans, Where None located.

5. DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor ____.
2. Moderate X.
3. Severe ____.
4. Disastrous ____.

Comments: Most of impoundment should be accomodated in Ashley Pond just below.

*This rating may change as land use changes (future development).

6. OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: Southerly end of main dam-concrete and ledge chute spillway-8' to 10' W.-chute carried through embankment by 10'X4'H. concrete arch culvert-invert 6' below top of embankment.

Controls Yes, TYPE: A concrete weir or baffle 2.7'H across chute 15' downstream of arch culvert.

Automatic____. Manual____. Operative Yes____, No____.

Comments: Minor spalling and cracks in side walls.

No. 2 Location and Type: Through gate house near center of dam-20"C.I. pipe water intake leading to Holyoke water system and to Ashley Reservoir.

Controls Yes, Type: Valve gates.

Automatic____. Manual X. Operative Yes X, No____.

Comments:

No. 3 Location and Type:

Controls____, Type:

Automatic____. Manual____. Operative Yes____, No____.

Comments:

Drawdown present Yes X, No____. Operative Yes X, No____.
Comments: See No. 2 above

---

7. DAM UPSTREAM FACE: Slope 3:1, Depth Water at Dam 30' to 35'.

Material: Turf X. Brush & Trees____. Rock fill____. Masonry____. Wood____.

Other Top 4' of slope turf-remaining surface rock paving.

Condition: 1. Good____. 3. Major Repairs____.

2. Minor Repairs X. 4. Urgent Repairs____.

Comments: Minor erosion from vehicular traffic along top of dam.

---

8. DAM DOWNSTREAM FACE: Slope 3:1.

Material: Turf X. Brush & Trees____. Rock Fill X. Masonry____. Wood____.

Other Rock toe fill near center of dam.

Condition: 1. Good____. 3. Major Repairs____.

2. Minor Repairs X. 4. Urgent Repairs____.

Comments: Erosion from bike trails on slope-gully 8" to 10" deep and 2' to 3' wide extends from top to toe of slope on down stream side.

9. EMERGENCY SPILLWAY: Available Yes. Needed No. Present chute spillway has been adequate for many years.

Height Above Normal Water 4½ Ft.

Width 10 Ft. Height 4.5 Ft. Material concrete and ledge.

Condition: 1. Good _____. 3. Major Repairs _____.

2. Minor Repairs X. 4. Urgent Repairs _____.

Comments: Concrete side walls badly cracked and spalled.

10. WATER LEVEL AT TIME OF INSPECTION: 7½ Ft. Above _____. Below X.

Top Dam X F.L. Principal Spillway _____.

Other _____.

Normal Freeboard 7 Ft. From invert of emergency spillway to top of embankment.

11. SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Yes-moderate growth of brush on downstream slope.

Animal Burrows and Washouts None found.

Damage to Slopes or Top of Dam Yes-see item #8 comments, also item #7 comments.

Cracked or Damaged Masonry Yes-side walls of spillway cracked and settled.

Evidence of Seepage Seepage flow noted from rock fill at toe of slope.

Evidence of Piping None found.

Leaks None found.

Erosion See item #7 and #8.

Trash and/or Debris Impeding Flow None found.

Clogged or Blocked Spillway None found.

Other _____.

(4) OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed X
3. Conditionally safe - major repairs needed_____
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

   Recommend removal from inspection list_____.

(5) REMARKS AND RECOMMENDATIONS: (Fully Explain)

Mr. Charles Moran, Supt. of Holyoke Water Dept., and Mr. Philip Sheridan, Chief Eng for Tighe and Bond Div. of S.C.I., were both present during this inspection. Conditions at the dam were found to be much the same as at last inspection of 1-24-74. The spillway structure has deteriorated slightly more with cracks in side walls more pronounced. Brush growth on down stream slope is evident. The seepage flow at toe of slope appeared to be the same as at last inspection and appears normal for this type of dam.

Dam appears safe with mostly routine maintenance repairs needed.

HTS/at

INSPECTION REPORT - DAMS AND RESERVOIRS

1. LOCATION:

City/~~Town~~ Holyoke. County Hampden. Dam No. 2-7-137-7.

Name of Dam McLean Reservoir Dam.

Topo Sheet No. 12A. Coordinates: Mass. Rect. N 430,200, E 282,300.

Inspected by: R.C. Salls, P.E., On Jan. 24, 1974. Date Last Inspection 1969

2. OWNER/S: As of Jan. 24, 1974

per: Assessors____, Reg. of Deeds____, Prev. Insp.____, Per. Contact X.

1. City of Holyoke Board of Water Commissioners - Room 8, City Hall, Holyoke, Mass.
   Name | St. & No. | City/Town | State | Tel. No.

2. ____
   Name | St. & No. | City/Town | State | Tel. No.

3. ____
   Name | St. & No. | City/Town | State | Tel. No.

3. CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Mr. Anthony Canon
Supt. of Water Dept., 20 Commercial Street, Holyoke, Mass.
Name | St. & No. | City/Town | State | Tel. No.

4. DATA:

No. of Pictures Taken None. Sketches See description of Dam.
Plans, Where No comprehensive plans found.

5. DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor____.
2. Moderate X.
3. Severe____.
4. Disastrous____.

Comments: Most of runoff should be accommodated in Ashley Pond just below

*This rating may change as land use changes (future development).

OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: Southerly end main dam concrete and ledge chute spillway - 8' to 10' wide - chute carried through embankment by 10' wide 4' high concrete arch culvert - flow line 6' below top of embankment.

Controls Yes, TYPE: A concrete weir or baffle 2.7 ft. high across chute 15' downstream of culvert.

Automatic ____. Manual ____. Operative Yes ____, No ____.

Comments: Some spalling and deterioration of concrete spillway side walls - also some cracks.

No. 2 Location and Type: Through gate house near center of dam water intake - 20' CI pipe to Holyoke water distribution system and to Ashley Reservoir.

Controls Yes, Type: Gates.

Automatic ____. Manual X. Operative Yes X, No ____. Per Water Dept. personnel

Comments: ____.

No. 3 Location and Type: ____.

Controls ____, Type: ____.

Automatic ____. Manual ____. Operative Yes ____, No ____.

Comments: ____.

Drawdown present Yes X, No ____. Operative Yes ____, No ____.

Comments: See No. 2 above.

---

7. DAM UPSTREAM FACE: Slope 3:1, Depth Water at Dam 20 ft. plus.

Material: Turf X. Brush & Trees ____. Rock Paving X. Masonry ____. Wood ____.

Other Top 4 ft. turf - remaining surface rock paving or fill.

Condition: 1. Good X. 3. Major Repairs ____.

2. Minor Repairs ____. 4. Urgent Repairs ____.

Comments: Stump of some small trees visible on slope. Cut since County inspection in 1969.

---

8. DAM DOWNSTREAM FACE: Slope 3:1.

Material: Turf X. Brush & Trees X. Rock Fill X. Masonry ____. Wood ____.

Other Miscellaneous brush and trees growing on slope - a rock toe fill near center of main dam apparently placed since construction. Has seepage.

Condition: 1. Good ____. 3. Major Repairs ____.

2. Minor Repairs X. 4. Urgent Repairs ____.

Comments: Seepage should be watched. District recommends that the owner install a seepage weir or other means of measuring amount of seepage.

(9.) EMERGENCY SPILLWAY: Available Yes . Needed No . Present chute spillway has been adequate for many years.

Height Above Normal Water 4.7 Ft. at time of inspection.

Width 10 Ft. Height 4.5 Ft. Material Concrete and ledge .

Condition: 1. Good _____. 3. Major Repairs _____.

2. Minor Repairs X . 4. Urgent Repairs _____.

Comments: Concrete sidewalls spalled and cracked.

(10.) WATER LEVEL AT TIME OF INSPECTION: 10 Ft. Above _____. Below X .

Top Dam X F.L. Principal Spillway _____.

Other _____

Normal Freeboard 7 Ft. From flow line emergency spillway to top of embankment.

(11.) SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Yes - See Item 8 above. Also some overg ornamental bushes on crest

Animal Burrows and Washouts None found

Damage to Slopes or Top of Dam None found

Cracked or Damaged Masonry Spalling and cracking overflow spillway masonry

Evidence of Seepage Visible seepage from rock fill at toe of main dam

Evidence of Piping None noted

Leaks None noted

Erosion None found

Trash and/or Debris Impeding Flow None

Clogged or Blocked Spillway _____

Other _____

(12.) OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed X.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

   Recommend removal from inspection list_____.

(13.) REMARKS AND RECOMMENDATIONS: (Fully Explain)

This reservoir was established around 1900 to provide water to the area west of Beech Street and we were told by various Water Department employees that some of the water impounded in the reservoir is pumped up from the Ashley Reservoir or from the Manhan Reservoir in Southampton. The information on the construction and internal structure of the embankment was indefinite but there was some indication that the embankment is built over and around a rather massive concrete wall with a sheet piling water stop in the base. Also, the exact nature of the pipes through the embankment and the controls in the gate house was not clear.

At the time of the inspection the embankments, both the main dam and the dike at the southerly end, were satisfactory as to alignment and grade. The roadway along the top showed no evidence of settlement and both slopes showed no signs of slumping or sliding. Brush on the upstream slope had been cut as recommended by the County Engineer but the stumps were still there. On the downstream slope brush and brambles are still growing and should be cleared and the slope mowed regularly. The stone paving or fill on the upstream slope was in satisfactory condition.

There is a rock fill at the downstream toe which in places appears to have been placed since the dam was constructed. Considerable seepage flow was visible here. This seepage appears to be of sufficient quantity so that a close watch should be kept on it and perhaps a seepage collection ditch and weir or some other means of measuring the amount of seepage should be installed.

The masonry sidewalls of the chute overflow spillway were badly spalled and cracked in places. Repairs should be made to prevent more serious deterioration.

RCS/js/vk

DISTRICT 2.

Submitted by R. C. Salls, P.E. Dam No. 2-7-137-7

Date January 24, 1974 City~~XXXX~~ Holyoke

Name of Dam McLean Reservoir Dam

1. Location: Topo Sheet No. 12A Mass. Rect. Coordinates N 430,200 E 282,300

Provide 8½" x 11" in clear copy of topo map with location of Dam clearly indicated.

On Paucatuck Brook - access via a private road southerly from Rte. 202 along shore of Reservoir - road about 1 mile westerly from intersection of Rte. 202 and Homestead Avenue.

2. Year built 1903 Date on Gate house Year/s of subsequent repairs Unknown

3. Purpose of Dam: Water Supply X Recreational ____
Flood Control ____ Irrigation ____ Other ____

4. Drainage Area: 0.47 sq. mi. ____ acres.
Type: City, Bus. & Ind. ____ Dense Res. ____ Suburban ____ Rural,Farm ____
Wood & Scrub Land X Slope: Steep X Med. ____ Slight ____
Reservoir also receives water from Ashley and Manhan Reservoirs.

5. Normal Ponding Area: 64 Acres; Ave. Depth Say 14 to 15 ft.
Impoundment: 330 million gals.; 950 acre ft.
Silted in: Yes ____ No X Approx. Amount Storage Area ____

6. No. and type of dwellings located adjacent to pond or reservoir None
i.e. summer homes etc. ____

7. Dimensions of Dam: Length 1620'± Max. Height 35'±
Freeboard 4.6 ft. to flow line overflow spillw
Slopes: Upstream Face 3:1 - stone paved
Downstream Face 3:1 - turf - rock fill at toe in places
Width across top 24 except for widening at gate house

Dam No. 2-7-137-7

8.

Classification of Dam by Material:

Earth X Conc. Masonry _____ Stone Fill X

Timber _____ Rockfill _____ Other _____

8a.

Dam Type: Gravity X Straight X Curved, Arched _____ Other _____

Overflow _____ Non-overflow X

Main dam straight - dike curves with contours.

9.

A. Description of present land usage downstream of dam:

100 % rural; _____ % urban

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure? Yes X No _____

C. Character Downstream Valley: Narrow _____ Wide X Developed _____

Rural 100* Urban _____

Ashley Pond below.

10.

Risk to life and property in event of complete failure.

No. of people None

No. of homes None

No. of businesses None

No. of industries None Type _____

No. of utilities 2 Type Holyoke Water Supply - Telephone trunk line

Railroads None

Other dams Ashley Reservoir Dam No. 2-7-137-9

Other *Above evaluation of risk assumes that released water is held in* Ashley Reservoir.

11.

Attach Sketch of dam to this form showing section and plan on 8½" x 11" sheet.

RCS/vk

Attachments

Locus Plan

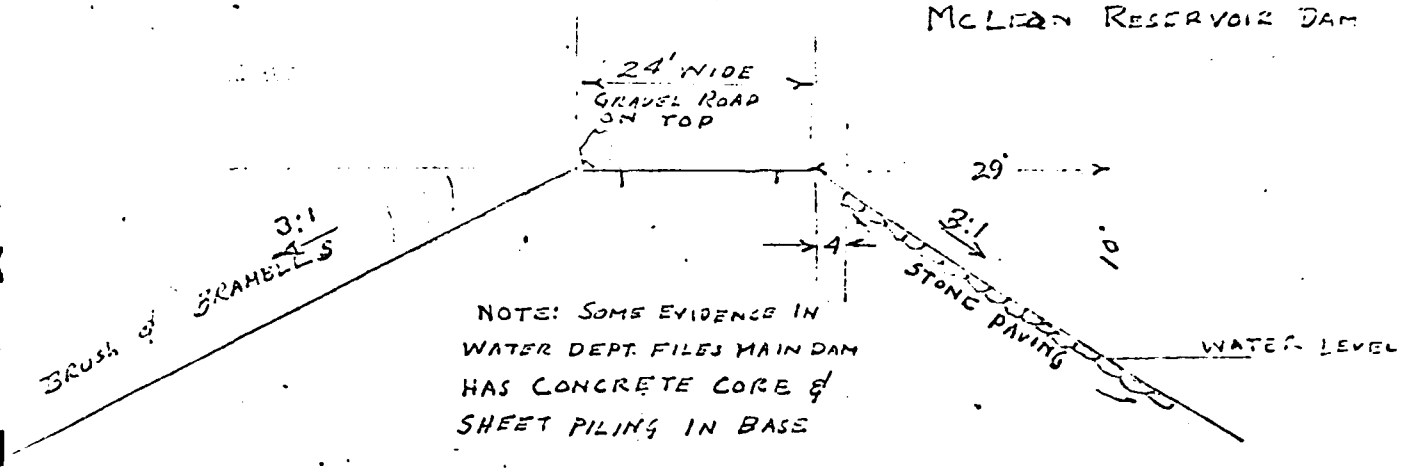
Sketches

EDGE
WATER
MCLEAN RESERVOIR
N
DIKE
520'
ABUT
EMBELLISHED
STONE PAVING ON SLOPE
TOE
SLOPE
1620' OVER ALL LENGTH DAM
300'
10
350' MAIN DAM
300'
WATER
STONE PAVING ON SLOPE
STONE FILL TOE
TOE & SLOPE SEEPAGE
GATE HOUSE
CONCRETE & LEDGE CHUTE OVERFLOW SPILLWAY
ROAD
APPROX. LOCATION OF INTAKE PIPE - NOTE: SEE PLAN FLEXIBLE PIPE
PLAN NOT TO SCALE

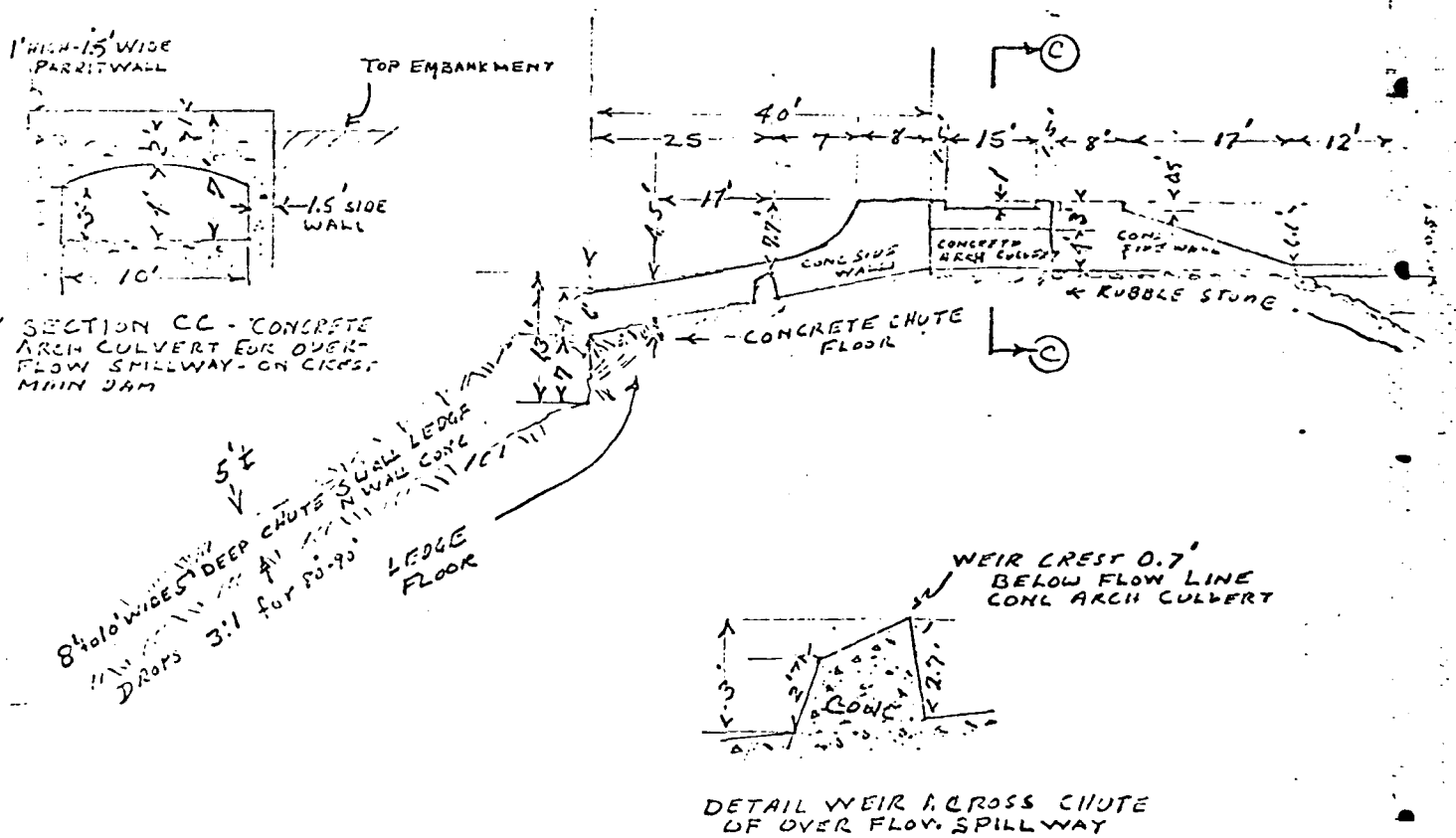

DAM No. 2-7-137-7
Radio Towers (WHYN)
Rock Valley
MOUNTAIN
EAST
Reservoir
Wright Pond
Ashley Pond
Snake Pond
Flower
Bradley Mtn
HOLYOKE
CITY
BOUNDARY
ROAD
WESTFIELD
HOMESTEAD
APREMONT
INTERCHANGE
12A

SKETCHES NOT TO SCALE

McLEAN RESERVOIR DAM



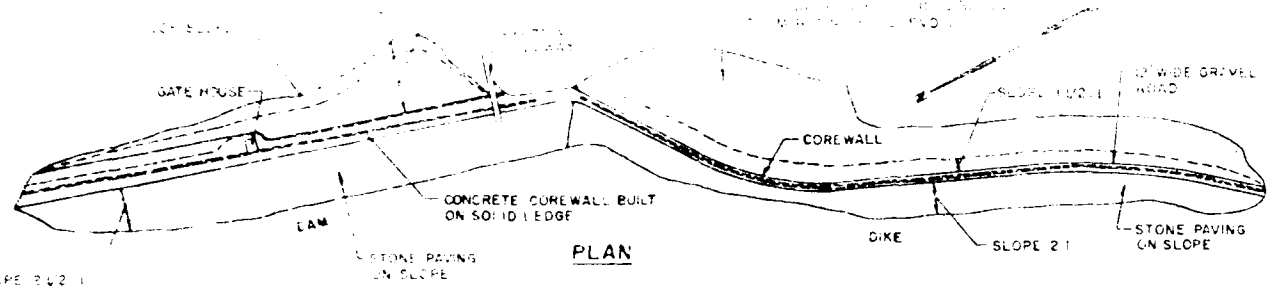
TYPICAL X SECTION MAIN DAM "AA"



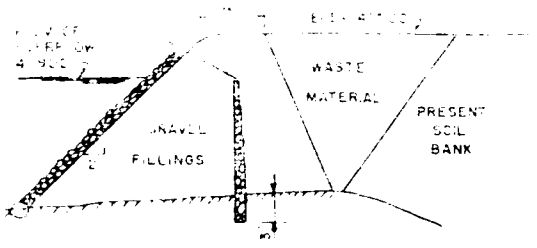
X SECTION CC - CONCRETE ARCH CULVERT FOR OVER-FLOW SPILLWAY - ON CREST MAIN DAM

DETAIL WEIR ACROSS CHUTE OF OVER FLOW SPILLWAY

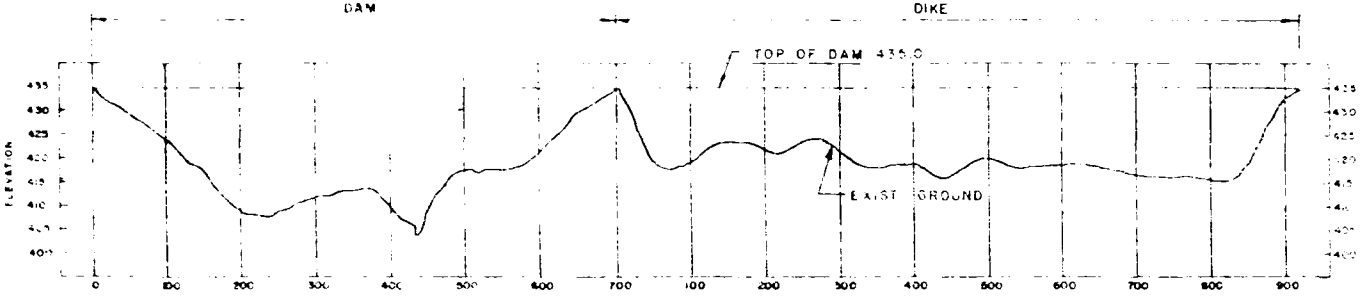
X SECTION "BB" THROUGH CHUTE OVERFLOW SPILLWAY AT S'LY END MAIN DAM



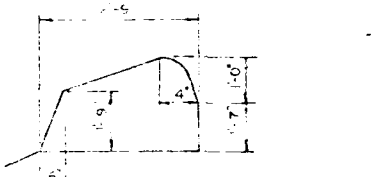
PLAN



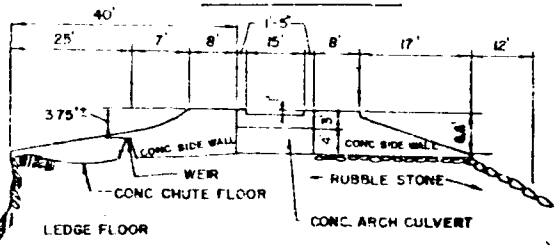
TYPICAL SECTION OF GRAVEL DIKE



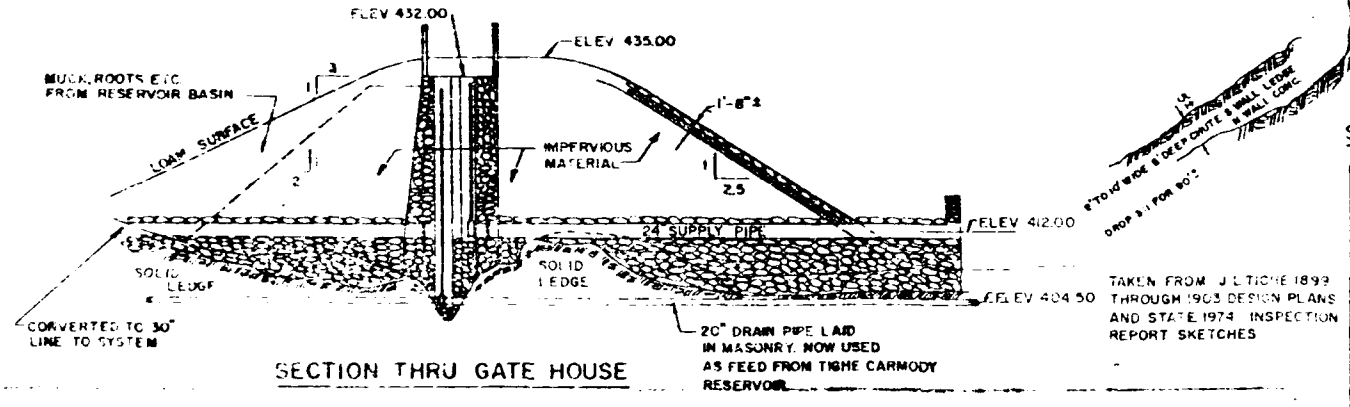
PROFILE



SECTION OF WEIR



SECTION THROUGH OVERFLOW SPILLWAY



SECTION THRU GATE HOUSE

TAKEN FROM J.E. TIGHE 1899 THROUGH 1903 DESIGN PLANS AND STATE 1974 INSPECTION REPORT SKETCHES

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NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

McLEAN RESERVOIR

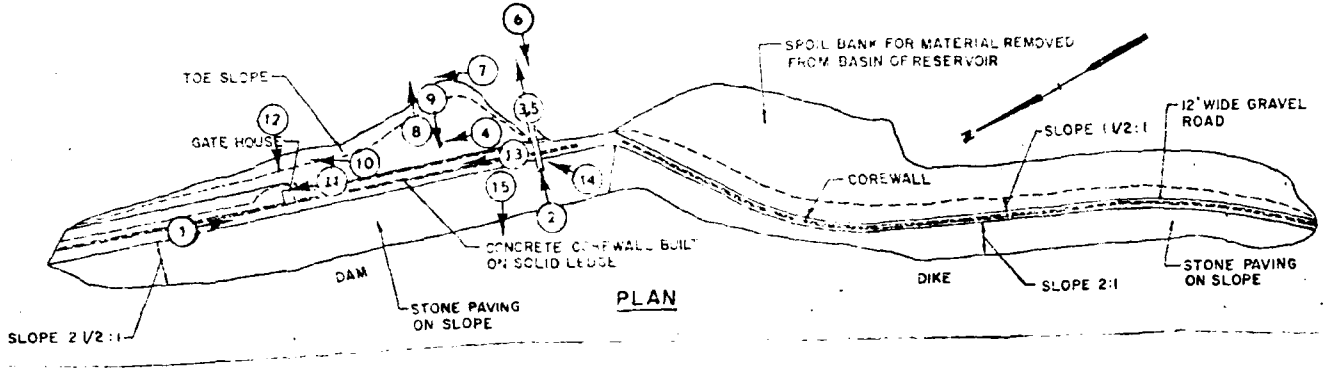
HOLYOKE MASSACHUSETTS

SCALE NOT TO SCALE

DATE FEBRUARY, 1978

APPENDIX C

PHOTOGRAPHS



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NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION OF PHOTOGRAPHS
McLEAN RESERVOIR

HOLYOKE MASSACHUSETTS

SCALE: NOT TO SCALE
DATE: FEBRUARY, 1979

PHOTO NO. 1 - Crest and upstream face of dam.

PHOTO NO. 2 - Approach channel of spillway weir.

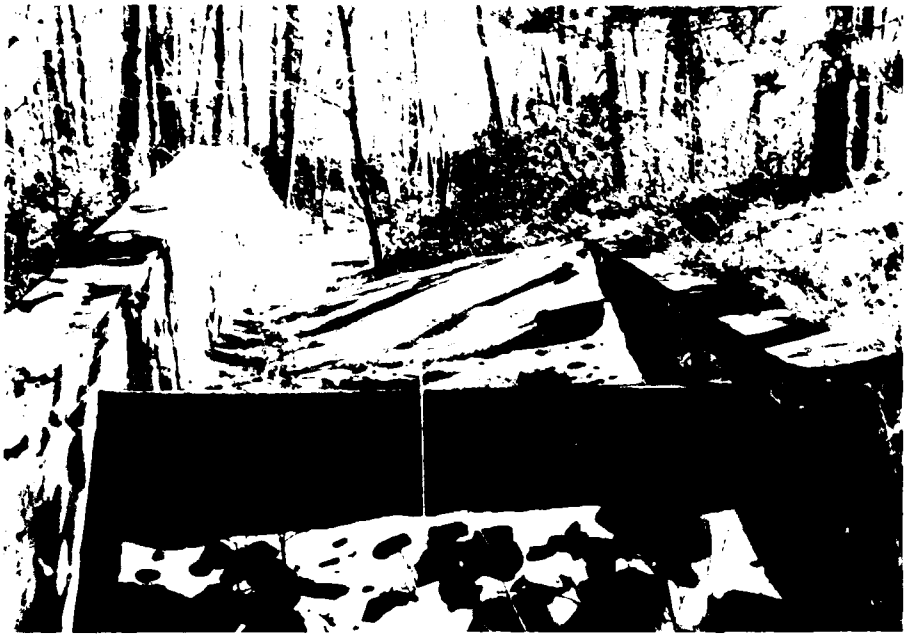

PHOTO NO. 3 - Spillway weir and outlet channel.

PHOTO NO. 4 - Downstream face of embankment viewed from spillway channel toward left abutment.

PHOTO NO. 5 - Outlet channel viewed from crest of weir.

PHOTO NO. 6 - Outlet channel viewed from bottom of channel looking up to top of dam.

PHOTO NO. 7 - Toe of embankment viewed from bottom of spillway channel toward left abutment.

PHOTO NO. 8 - Wet area at toe of dam about 30 feet from spillway channel toward left abutment.

PHOTO NO. 9 - Bedrock outcrop at toe of dam above wet area shown in PHOTO 8. Water is leaking from joints.

PHOTO NO. 10 - Downstream face of dam from top of "berm" above toe of dam.

PHOTO NO. 11 - Toe of berm at a point 100 feet right of gatehouse. Wet, swampy area in lower right hand corner of photograph.

PHOTO NO. 12 - Downstream face of dam below gatehouse.

PHOTO NO. 13 - View of crest and upstream face of dam taken from spillway

PHOTO NO. 14 - Left training wall of spillway.

PHOTO NO. 15 - View of McLean Reservoir.

HAYDEN, HARDING & BUCHANAN, INC
CONSULTING ENGINEERS
BOSTON MASSACHUSETTS

JOB NO. ___ DATE 12/... BY EDD CHKD BY ... SHEET NO. 1 OF ...
JOB Dam Safety Inspections SUBJECT ... CLIENT COE

McLean Reservoir Dam

Hydraulic Data from COE Inventory of Dams in the US & State Inspection

Crest length = 1620' ✓

Spillway width = 10' ✓

Impoundment Cap (Estimated)

normal = 950 ac-ft ✓

max = 1240 ac-ft

Drainage area = 0.47 sq mi

Structural Height = 42'

Hydraulic Ht = 35' ✓

Hydraulic Data from Field investigation

Spillway width = 10'

Impoundment Cap

... = 365 mg = 48793200 cf = 1120 ac-ft

SIZE CLASSIFICATION

Size Category

Height = 35' → Small

Max Imp. Cap = 1240 ... → Intermediate

∴ Use Intermediate Size Classification ✓

HAZARD POTENTIAL CLASSIFICATION

... Low - ... downstream dams hold ... minimal - ... mostly undeveloped.

HH&B HAYDEN, HARDING & BUCHANAN, INC
CONSULTING ENGINEERS
BOSTON MASSACHUSETTS

Determine Test Flood

For Low Hazard & Intermediate Size:

Range 100yr to 1/2 PMF

Test flood = 100yr storm

No development down stream, water dept. dam, & very small drainage area. Flow controlled by water dept In-out by water mains & demand normal level 427 - sometimes much lower.

Area determined on 1:24000 scale USGS Quad Sheet (Mt. Tom) & planimetered from that.

$R_1 = 3.44$ $R_2 = 3.47$ $R_3 = 3.48$ $R_{ave} = 3.46$ in^2

$A = \frac{24000^2}{43560} \times 3.46$ ac $= 317.1$ ac $= 0.496$ sq. mi. (check Mass. Inspect. data: $A = 0.47$ sq. mi.)

Say 300 acres

Peak Flow:

Its area < 2 sq. mi. use PMF = 3000 cfs/sq. mi.

PMF for area = $3000 \frac{cfs}{sm} \times 0.5$ sm = 1500 cfs.

Test flood = $(\frac{1}{4} \times 1500) = 375$ cfs

100yr = 375 cfs.

12/15/78
FDS
MA 12/26

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BOSTON, MASSACHUSETTS

JOB Dam Safety Inspn
SUBJECT Nelson Res Dam
CLIENT COE

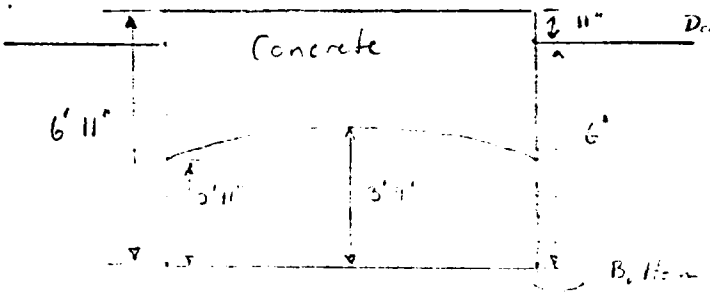
Outlets

#1 - 24" C.I.P. Inv In elev = 411.0 - Water Supply Pipe
(From Plan "Section thru Gate House")
Assume inlet gate closed during Flood, i.e. ignore pipe

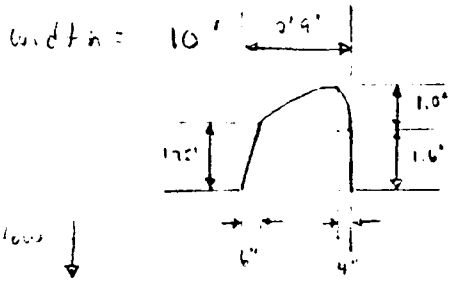
#2 - Spillway - 10' wide; control at arch culvert

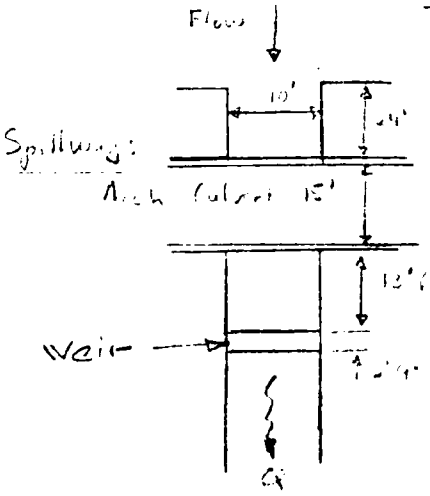
From Plans & Field Recon Sketch:

Arch Culvert:



Weir: approx 13.5' downstream of Culvert





Effect of weir on flow through arch culvert significant (see pg 12)

Discharge controlled by weir

JOB NO 76.45.1
DATE 3/24/76
BY MC
CH'D BY

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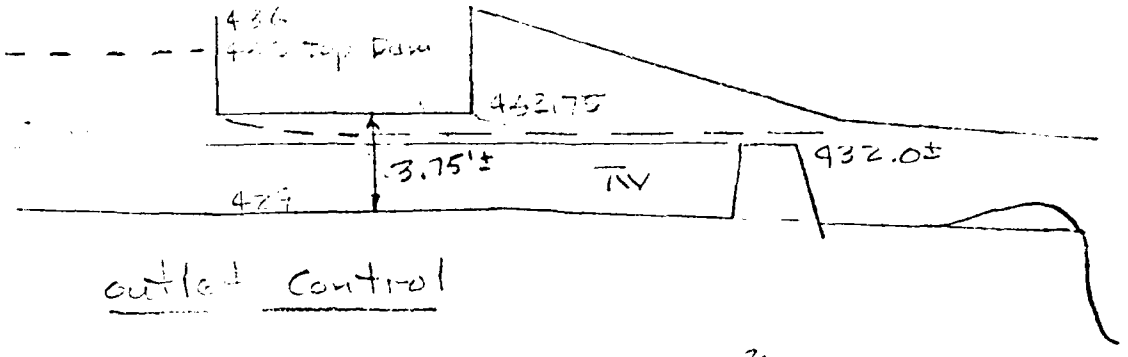
BOSTON MASSACHUSETTS

SHEET NO 4
JOB Lynn
SUBJECT McLean
CLIENT City

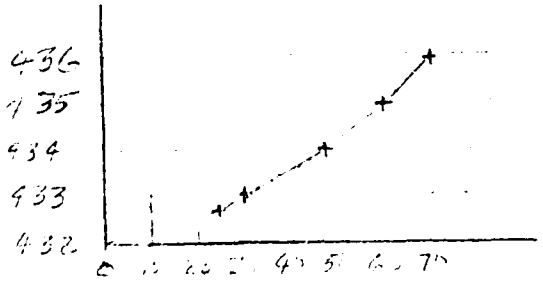


outlet Control

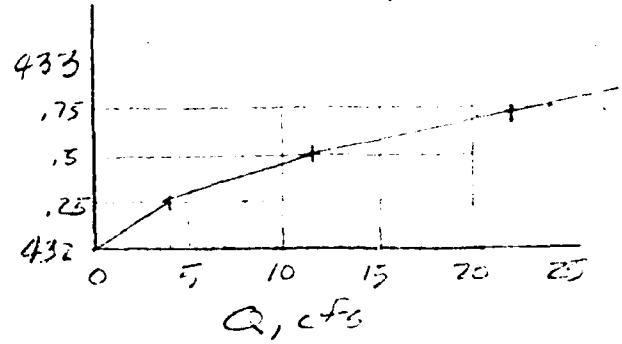
Flow over weir $Q = CLH^{3/2}$

E	D	C	L	Q
432.25	.25	3.10	10	3.9
432.5	.50	3.20	10	5.7
432.75	.75	3.30	10	11.7
433	1.0	3.38	10	22
433.5	1.5	"	"	34
434	2.0	"	"	62

Culvert Flow



Culvert Flow
(from nomograph)



Weir

JOB NO 75 [illegible]
DATE [illegible]
BY [illegible]
CH'D BY [illegible]

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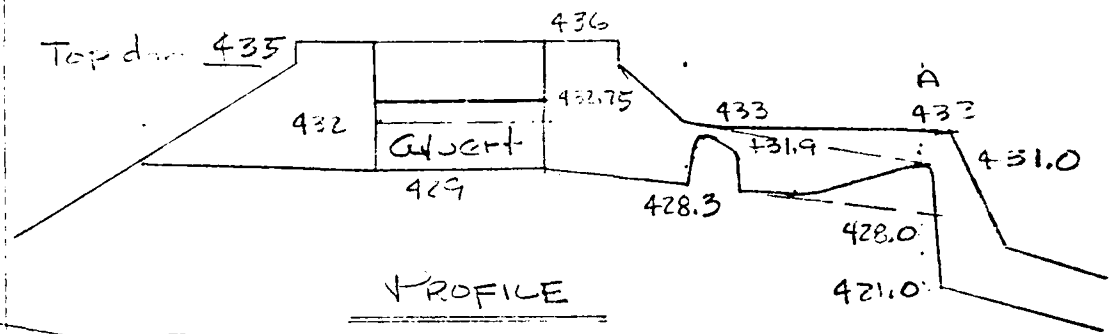
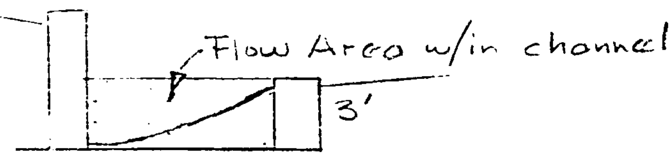
BOSTON MASSACHUSETTS

SHEET NO 5
JOB Dam
SUBJECT McLean
CLIENT Corp



PROFILE



SECTION @ A

Flow Area = ½ (3)(10) = 15 sf @ D = 3'.

$V = \frac{1.486}{.015} (R^{2/3}) \left(\frac{.3}{..}\right)^{1/2}$ $\quad Q = VA$, $V = \frac{Q}{A}$

$R^{2/3} = \frac{V}{12.1} = \frac{Q}{12.1 \times A}$ $\quad Q = R^{2/3} \times 12.1 \times A$

D	A	WP	$R^{2/3}$	Q
3	15	19	1.04	189
2	8	11	0.86	83
1	3.4	6	0.67	28
½	1	3.5	0.43	5.2

will not interfere w/ flow from weir

JOB NO. 75-214.1 | DATE 3/25/7[illegible] | BY MG | CH'D BY [illegible]

HH&B HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON MASSACHUSETTS

SHEET NO. 6 | JOB Dam | SUBJECT McLean | CLIENT Corps

Q_{P_1} = 375 El_1 = 435.35 $Stor_1$ = 1245-1090 = 155 or 6.2"
6.2" > 4.75" = 19/4 for 100 yr storm
Let $Stor_1$ = $\frac{155+0}{2}$ = 78 a-f or 3.12"

$Q_{P_2} = 375(1 - \frac{3.12}{4.75}) = 130$ cfs El_2 = 435.1
$stor_2$ = 1245-1090 = 155 $Stor_a = \frac{155+78}{2}$ = 116.5 or 4.66"

$Q_{P_3} = 375(1 - \frac{4.66}{4.75}) = 7.1$ cfs El_3 = 432.35
$Stor_2$ = 1185-1090 = 95 $St_{ave} = \frac{116.5+95}{2}$ = 105.75 or 4.23"

$Q_{P_4} = 375(1 - \frac{4.23}{}) = 41$ cfs El_4 = 433.6
$Stor_4$ = 1210-1090 = 120 $St_{ave} = \frac{120+105.75}{2}$ = 112.9 or 4.52"

$Q_{P_5} = 375(1 - \frac{4.52}{}) = 18.6$ cfs El_5 = 432.65
$Stor_5$ = 97 $St_{ave} = \frac{97+112.9}{2}$ = 105 or 4.2

$Q_{P_6} = 375(1 - \frac{4.2}{}) = 43.6$ El_6 = 433.8
$Stor_6$ = 1215-1090 = 125 St_{ave} = 115 or 4.6"

$Q_{P_7} = 375(1 - \frac{4.6}{}) = 11.8$ El_7 = 432.5
Stor = 1190 - 1090 = 100 $St_{ave} = \frac{100+115}{2}$ = 107.5 or = 4.3"

$Q_{P_8} = 375(1 - \frac{4.3}{}) = 35.5$ El_8 = 433.3 Stor = 115 111.25 ave 4.45

$Q_{P_9} = 375(1 - \frac{4.45}{}) = 23.7$ cfs El_9 = 432.75 S_9 = 1195 105 108.25 ave 4.33

$Q_{P_{10}} = 375(1 - \frac{4.33}{}) = 33$ El_{10} = 433.3 S_{10} = 1205 115 ave 112 or 4.46

$Q_{P_{11}} = 375(1 - \frac{4.46}{}) = 23$ El_{11} = 432.8 S_{11} = 1195 105 S_{ave} 109 4.34

$Q_{P_{12}} = 375(1 - \frac{4.34}{}) = 32.$ El_{12} = 433.2

Let Elev = 433 Q_{out} = 30 cfs

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CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

Determine Weir Flow over top of dam:

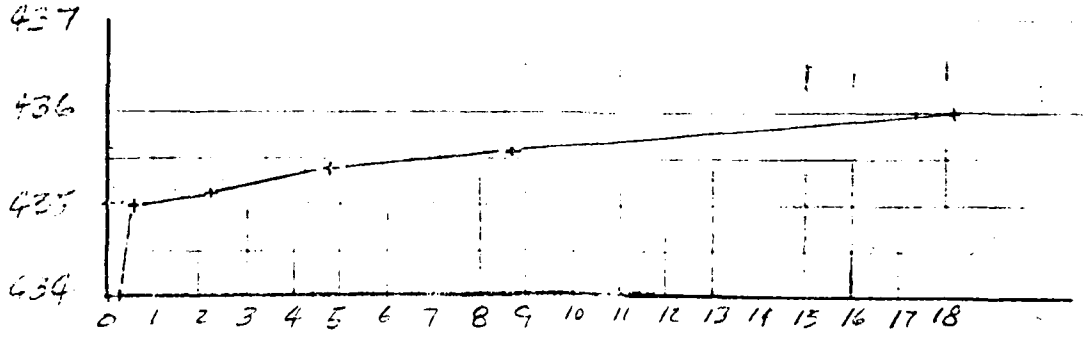
Assume flow only on "dam crest" - not on dike
Length $L = 650'$ width $W = 10'$

Assume have broad crested weir

Use weir formula: $Q = CLH^{3/2}$

$L = 650'$, H - varies, C - varies with H
C - values obtained from Kings "Handbook of Hydraulics"

El.	H, ft	C	L, ft	$H^{3/2}$	Q, cfs	$Q_{Act.}$
435.0						0
[illegible]	0.2	[illegible]	650	0.089	144.9 - 145 ✓	208
[illegible]	0.4	[illegible]	"	0.253	421.0 - 420	485
435.6	0.6	[illegible]	"	0.465	815.6 - 815	873
435.8	0.8	[illegible]	"	0.716	1251.1 - 1250 ✓	
436.0	1.0	[illegible]	"	1.0	1742 - 1740	1810



Q x 100 cfs

- Discharge - combined flow over dam

For Flow under 150 cfs see pg 4 chart

Assume Dam Fails

Peak storage = 1240 ac-ft

Height at failure = 35± ft
width @ mid-height = 430' (measured from plans)

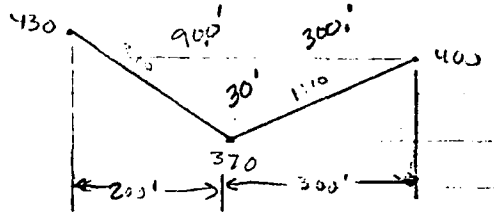
Peak Failure outflow = $Q_{p_f} = 8/27\, W_b \sqrt{g}\, Y_o^{3/2}$

with $W_b = .4(L) = .4 \times 430 = 172'$
$Y_o = 35'$

$$Q_{p_f} = \frac{8}{27} \times 172 \times \sqrt{\frac{5,674}{161}} \times (35)^{3/2} = 57,880 \pm \text{cfs}.$$

1st reach: Determine Storage Capacity in reach
300' Downstream

X sect'l



use $n = 0.025$

$S = \frac{416 - 370}{300} = 0.15$

@ H = 9' $A = \frac{1}{2}(30+90) \times 10 = 600$ sf

$P = 2(10 + 90.6) = 122.2$ ft

$R = 4.91$

$$Q = \frac{1.49}{.025} \times (4.91)^{2/3} (.15)^{1/2} \times 600 = 40,500 \pm \text{cfs} < 57,880$$

@ H = 15' $A = \frac{1}{2}(50+150) \times 15 = 1500$ sf.

$P = (50.7 + 150.7) = 202.1$

$R = 7.37$

$Q = \frac{1.49}{n} \times (7.33)^{2/3} (.6)^{1/2} \times 150 = 131,365^{\pm}$ cfs > 59,980 cfs

@ H = 11' $A = \frac{1}{2}(367 + 113) \times 11 = 806.9 \sim 807$ sf

$P = 330.3 + 110.5 = 1469$

$R = 5.423$

$Q = \frac{1.49}{1075} \times (5.17)^{2/3} \times 0.15^{1/2} \times 807 = 57670^{\pm}$ cfs

3.104 .3872

Flood height @ 300' Downstream dam - just over 11 Ft.

Reach Storage Capacity : Area x Reach Length

$V_1 = \frac{807 \times 300}{43,560} = 5.6$ ac-ft

Trial Q to reach 2 = $Q_{p_2} = Q_{p_1}\left(1 - \frac{V_1}{S}\right) =$

$= 59,980\left(1 - \frac{5.6}{1240}\right)^{1.5}$

use $Q_{p_2} = Q_{p_1}$

2nd Reach : 1200' downstream

X-Section :

use $n = 0.030$

$S = \frac{50}{700} = 0.07$

@ H = 10' A = [illegible] sf

P = 1000 ft.

R = 5.0

NO. 7½ 4"
E 12 | 15 | 78
D BY MA

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON MASSACHUSETTS

SHEET NO. 10
JOB Dam Safety Inspection
SUBJECT McKee Rec Dam
CLIENT COE

$Q = \frac{1.49}{.03} \times (5.0)^{2.00} \times (.07)^{.269} \times 5000 = 192,116^{\pm}$ cfs > 59,990

@ H = 5' $A = \frac{1}{2} \times 5 \times 500 = 1250$ sf ✓

$P = 500'$

$R = 2.5$

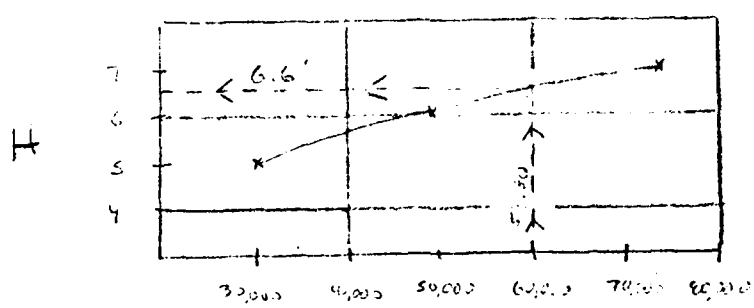
$Q = \frac{1.49}{.03} \times 2.5^{2/3} \times .07^{1/2} \times 1250 = 30,256^{\pm}$ cfs. < 59,990

@ H = 7' $A = \frac{1}{2} \times 7 \times 700 = 2450$ ✓

$P = 700$

$R = 3.5$ ✓

$Q = \frac{1.49}{.03} \times 3.5^{2/3} \times .07^{1/2} \times 2450 = 74215^{\pm}$ cfs. > 59,990



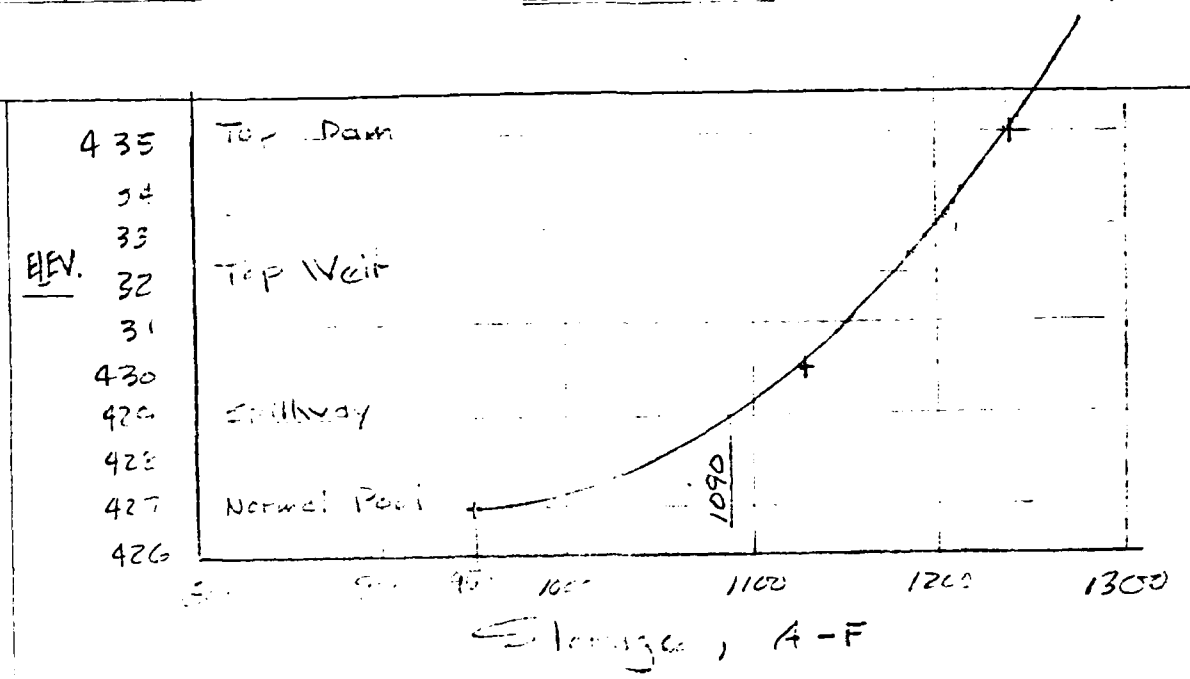
Flood Height @ 1700' downstream dam 6.6' ±

Depending upon culvert size under road, and elevation of road, may overtop Westfield Road

JOB NO. [illegible]
DATE 3/22/79
BY N.A.
CH'D BY F.I.D.

HH&B HAYDEN, HARDING & BUCHANAN, INC
CONSULTING ENGINEERS
BOSTON MASSACHUSETTS

SHEET NO. 11
JOB Dams
SUBJECT McLaren
CLIENT Corps



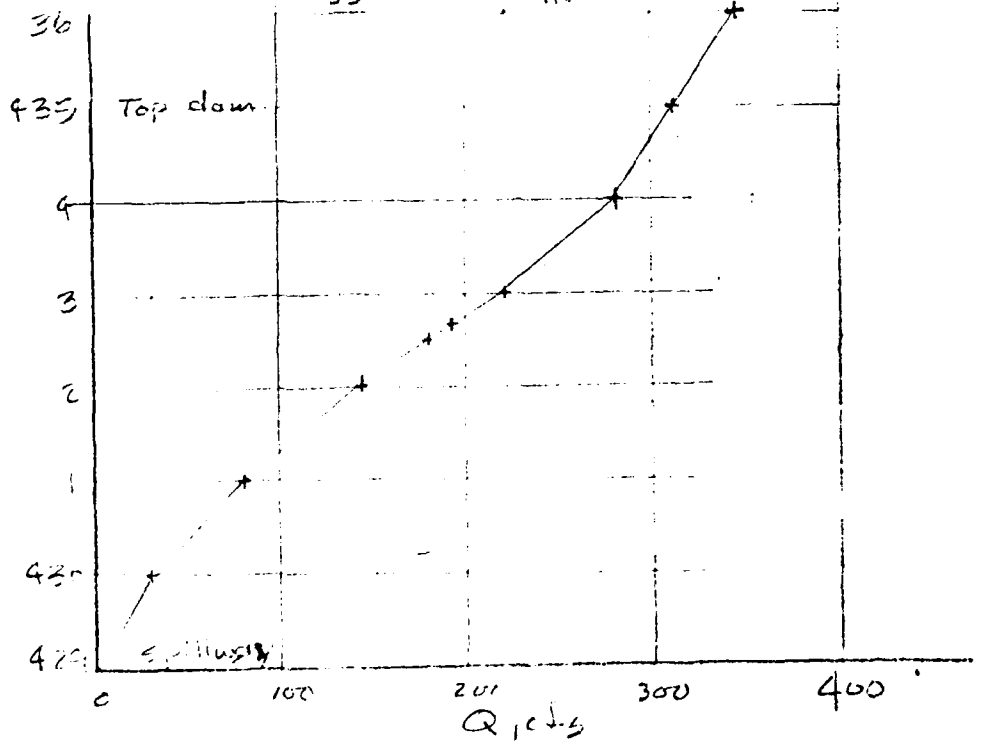
Storage, A-F

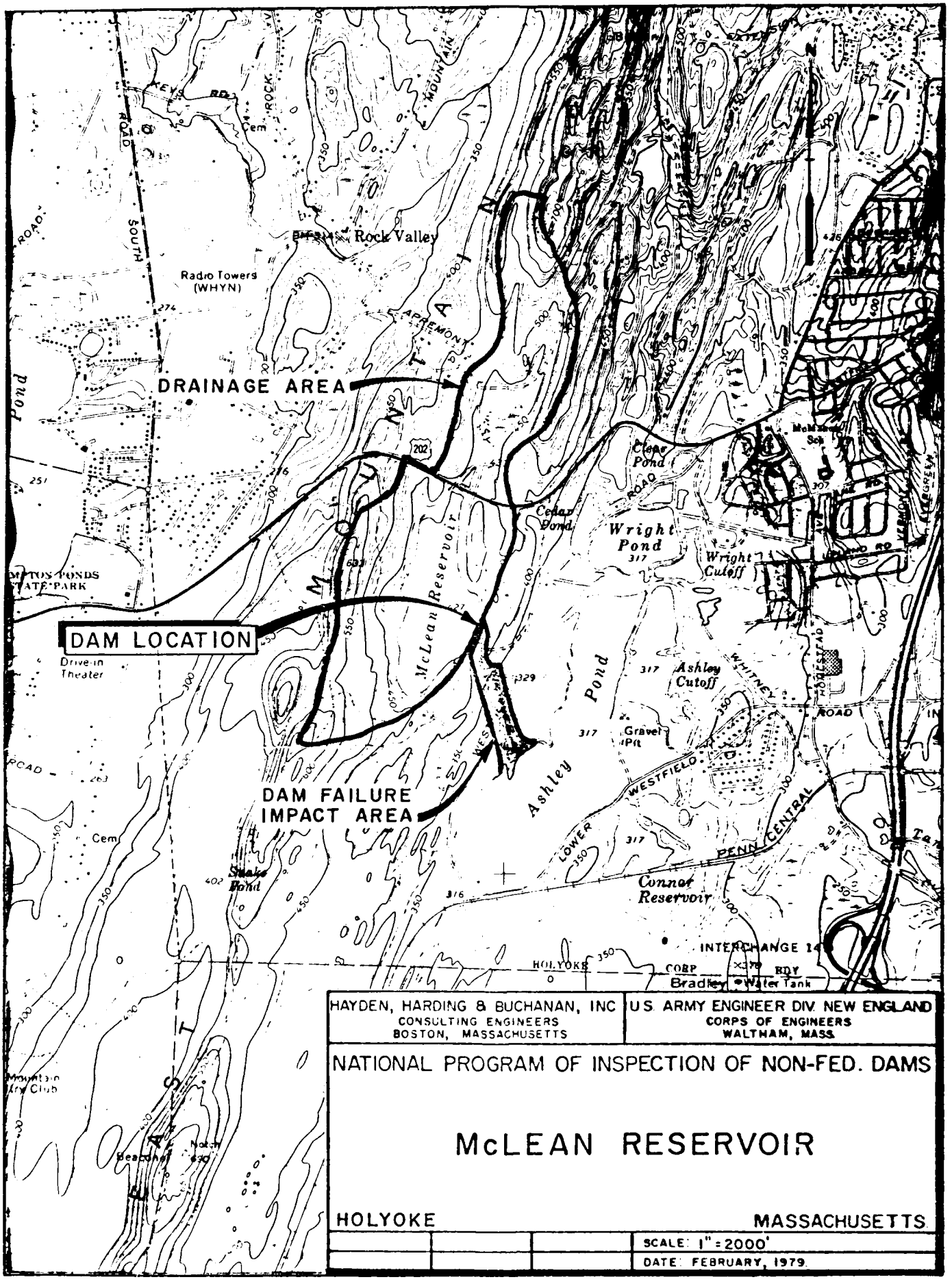
Storage Capacity of McLean Reservoir

@ Elev = 427 (Normal Pool) , Volume = 950 ac-ft
@ Elev = 430 , Volume = 1130 ac-ft
@ Elev = 435 (max. height) , Volume = 1240 ac-ft

Potential Spillway Capacity if Weir Removed

Elev.	Height in	Discharge cfs.		
30	1.0	30		
31	2.0	80		
32	3.0	145		
32.5	3.5	190	34.5	280
33.6	3.6	190	35.6	310
32.9	3.9	215	36.7	340
33	4.0	220		





HAYDEN, HARDING & BUCHANAN, INC CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

McLEAN RESERVOIR

HOLYOKE MASSACHUSETTS

SCALE: 1" = 2000'

DATE: FEBRUARY, 1979

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(9) NAME	(10) LATITUDE (NORTH)	(11) LONGITUDE (WEST)	(12) REPORT DATE DAY | MO | YR
MA	539	NED	MA	013	01				MCLEAN RESERVOIR DAM	4210.5	7240.2	23FEB79

(13) POPULAR NAME	(14) NAME OF IMPOUNDMENT

(15) REGION	(16) BASIN	(17) RIVER OR STREAM	(18) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(19) DIST FROM DAM (MI.)	(20) POPULATION
01	CR	20IN OUTLET TO ASHLEY POND	HOLYOKE	0	50112

(21) TYPE OF DAM	(22) YEAR COMPLETED	(23) PURPOSES	(24) STRUCTURAL HEIGHT (FT.)	(25) HYDRAULIC HEIGHT (FT.)	(26) IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	(27) NORMAL (ACRE-FT.)
REPGERCT	1903	S	39	36	1240	950

DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
NED	N	N	N	N	07MAR79

(28) REMARKS

(29) D/S HAS	(30) SPILLWAY CREST LENGTH	(31) SPILLWAY TYPE	(32) SPILLWAY WIDTH (FT.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) POWER CAPACITY PROPOSED (MW)	(37) NAVIGATION LOCKS NO.	(38) LENGTH (FT.)	(39) WIDTH (FT.)	(40) LENGTH (FT.)	(41) WIDTH (FT.)	(42) LENGTH (FT.)	(43) WIDTH (FT.)	(44) LENGTH (FT.)	(45) WIDTH (FT.)
3	1620	U	10	310												

(46) OWNER	(47) ENGINEERING BY	(48) CONSTRUCTION BY
CITY OF HOLYOKE BOARD CM	J.L.TIGHE	

(49) REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

(50) INSPECTION BY	(51) INSPECTION DATE DAY | MO | YR	(52) AUTHORITY FOR INSPECTION
HAYDEN HARDING + BUCHANAN, INC	06DEC78	PUBLIC LAW 92-367

(53) REMARKS

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

END

FILMED

8-85

DTIC